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Implementing supplemental course material websites for higher education technology courses

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Abstract

Supplemental websites have the potential to assist students in gathering course materials, encouraging topic exploration, and increasing the ability for students to communicate in a traditional face-to-face technology college classroom. This project description presents the results of a supplemental website's development and deployment into a traditional face-to-face college technology course, and measures its success. The research focuses on successful Internet employment within traditional classrooms to ensure that the content of the supplemental website has value to the students. The methodology used to develop the website and select materials was based upon the Dick and Carey Instructional Design Method (Dick & Carey, 2001). The project reaches two major conclusions: a) based on student responses and server logs, the supplemental technology website is being used by students and b) students value having the resource available to them during the technology course.

IMPLEMENTING SUPPLEMENTAL COURSE MATERIAL WEBSITES

FOR HIGHER EDUCATION TECHNOLOGY COURSES

A Graduate Project

Submitted to the

Division of Educational Technology

Department of Curriculum and Instruction

In Partial Fulfillment

of the Requirements for the Degree

Masters of Arts in Educational Technology

UNIVERSITY OF NORTHERN IOWA

by

Mark W. Bromwich

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This Project by: Mark Bromwich

Titled: IMPLEMENTING SUPPLEMENTAL COURSE WEBSITES FOR HIGHER

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has been approved as meeting the research requirements for the

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ABSTRACT

Supplemental websites have the potential to assist students in gathering course materials, encouraging topic exploration, and increasing the ability for students to communicate in a traditional face-to-face technology college classroom. This project description presents the results of a supplemental website's development and deployment into a traditional face-to-face college technology course, and measures its success. The research focuses on successful Internet employment within traditional classrooms to ensure that the content of the supplemental website has value to the students. The methodology used to develop the website and select materials was based upon the Dick and Carey Instructional Design Method (Dick & Carey, 2001). The project reaches two major conclusions: a) based on student responses and server logs, the supplemental technology website is being used by students and b) students value having the resource available to them during the technology course.

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INTRODUCTION

Description

This paper describes a website project created by the author to provide his college technology students the ability to access course information using a web-based delivery system. This project demonstrates how the author's website, used to deliver such materials to college technology students, has educational value. The project found the website to be a valuable tool in providing the students a blended classroom environment, and a means for further topic exploration by using several web based multi-media delivery modes to provide the students with additional course materials. For this project, the term blended is referring to a classroom environment that is both a traditional face-to-face model and having a online delivery component.

Implementing Supplemental Course Material Websites was a project in which students had the ability to explore technology course materials for both remediation of what was taught in the face-to-face classroom and for further exploration of technology topics. The course materials were collected by the author, converted to an online delivery mode that made the materials easy to use by the students, and then placed on the supplemental website.

The initial development of the project began when the author needed a convenient approach to provide students with a means of gathering basic course materials. At the onset, the website was quite basic. It provided course materials in either simple hypertext documents or in downloadable Microsoft Word documents. These materials included the syllabi, class schedules, and lecture notes. The website also provided the students two

modes of communication with either the instructor, or between the students themselves, via an email hyperlink and an electronic bulletin board.

This project has evolved over a period of time as technology has progressed. The ability to provide students with more course materials in a number of convenient delivery modes has made the website more than just an access point for syllabi, schedules, or a quick way to send the instructor an email. It has transformed the traditional face-to-face classroom into a blended classroom situation where students learn in both real and virtual environments.

Rationale

There were several reasons for developing the *Implementing Supplemental Course Materials Websites* (ISCMW) project. These reasons included increasing the students' ability to directly access appropriate technology course materials using a course website; allowing further topic exploration by providing students supplemental materials within the website; and increasing the ability of the students to communicate, both synchronously and asynchronously, using the supplemental website.

Perhaps one of the most common uses of the web in education is in providing course-specific websites (Washenburger, 2001). Washenburger supports the perception that supplemental websites are currently used in support of education. A study conducted by Leung and Ivy (2003) suggests that students use course websites and perceive those websites as enhancing their learning. The desirability for such a resource website had been identified by student requests and it was the author's intention to provide such a resource for his students.

The ISCMW provided the students involved in a college technology course with the

opportunity to further explore the topics presented in the traditional face-to-face classroom environment. Chickering and Ehrmann (1996) stated that technological resources can invite different methods of learning. They also noted that visuals could be a powerful supplemental learning experience for the student.

ISCMW was designed to increase the ability for students to communicate in several different modes. According to Chickering and Erhmann, these communication technologies can increase student access to faculty members and help students share resources. Online communication tools can also provide for collaborative problem solving, and shared learning can usefully augment face-to-face contact in and outside of class meetings (Chickering & Ehrmann, 1996).

<center>Purpose</center>

The purpose of the ISCMW project is to further the educational boundaries of the traditional face-to-face technology classroom where the author currently teaches. This project also allowed the author an opportunity to merge what he (and the research) identified as best about the traditional face-to-face delivery and online models to create a hybrid, or blended, classroom situation for his students.

The tools and materials employed by ISCMW provided college technology students access to current course materials and to additional materials for further exploration into the topics taught within the technology courses. It also provided the ability to communicate synchronously and asynchronously with both the instructor and with fellow students. By using the supplemental website developed by the instructor, the students were involved in a student-centered blended learning environment that enabled the students to further explore their interests in the current topics being taught. Providing

the tools and materials within the site encouraged the students to further explore the topics presented in class and also allowed students, as M.J. Hannafin (1992) expresses, to address their unique learning interests and needs and examine content at multiple levels of complexity to deepen their understanding.

<div align="center">Importance</div>

"It took 38 years for commercial radio to reach an audience of 50 million, and 13 years for television to reach the same goal. However, it took the Internet only five years to have that many users" (Sokolosky, 2001). Current world users of the Internet are estimated at a little more than 1.58 billion of the 6.60 billion people on the planet; the United States accounts for a portion of those numbers with 220 million of the 337 million people being Internet users ("Internet World Stats", 2009). It is safe to assume that the Internet is no longer a hobby for the *computer geeks*, but it is a utility that many people throughout the world have embraced as a part of everyday life. Users can perform everyday tasks such as shopping, banking, and gathering news via the *click* of a mouse without ever leaving the comfort of their homes. It seems as though it is becoming second nature to give a URL to communicate an idea to another person instead of referencing a book.

The importance of the ISCMW project is in the value it added to the student experience in college technology courses taught by the author.
The college classroom has limited time and assets to provide students with personalized educational experiences and, although instructors do all they can to provide the students with the best experience possible, not all students learn the same way. There is no way to ensure that the time spent with the students as a whole is uniquely valuable to each of the

students at any given time (Torrisi-Steele, 2002). This is where the ISCMW project was beneficial to the students. Visual learners could go to the site to see a streaming video of what was demonstrated in class earlier. Auditory learners could benefit from downloading a podcast of the lecture and re-listening to what was said in the classroom. These are just a couple of examples of what is possible on the web, and it demonstrates how well-chosen information, in formats that are appropriate and available on the Internet, can truly enhance traditional face-to-face learning environments. Providing the student with additional avenues in which he/she may want to augment his/her education, and further explore the topics presented in the classroom encourages an intrinsic need to learn more about a topic (Rossett, 2002).

Terminology

Bandwidth – the maximum speed at which data can be transmitted between two nodes on network (Evans, Martin, & Poatsy, 2008, p. 307).

Blended Learning – the integrated combination of traditional learning with web-based on-line approaches using a combination of media and tools employed in an e-learning environment (Harris, 2003, p. 1).

HTML (Hypertext Markup Language) – the language used to create documents on the World Wide Web (Sklar, 2003, p. 1).

FTP (File Transfer Protocol) – common protocol used to transfer files over the Internet, used to upload and download file from one computer to another (Evans, Martin, & Poatsy, 2008, p. 112).

GUI (Graphic User Interface) – graphical user displays that use the point and click technology of the mouse and curser, designed to allow user communications (Evans, Martin, & Poatsy, 2008, p. 210).

Hyperlink – a special formatting for pieces of text within a website that allows a user to navigate from one webpage to another (Evans, Martin, & Poatsy, 2008, p. 111).

MySQL – a free open-source database program commonly used on Linux web servers (Evans, Martin, & Poatsy, 2008, p. 209).

PHP (Pre-Hypertext Processor) – a server-side scripting language that can be used by itself, or in conjunction with a database, to produce dynamic web content (Meloni, 2004, p. 15).

Podcast – a clip of audio or video content that is broadcast over the internet using compressed audio or video files in formats such as MP3 (Evans, Martin, & Poatsy, 2008, p. 452).

Website – a location on the World Wide Web, which includes a connected group of web pages as a single entity (Evans, Martin, & Poatsy, 2008, p. 466).

URL (Universal Resource Locator) – an address that is unique to each website on the Internet, and allows the user to connect to the site's home page (Evans, Martin, & Poatsy, 2008, p. 111).

METHODOLOGY

Literature Review

The ISCMW project is part of a blended learning environment where students in a traditional face-to-face college technology course have the opportunity to use this website for accessing additional materials and as a means for both synchronous and asynchronous communications. This review addresses how a blended environment can be more effective than a traditional face-to-face learning environment. Furthermore, this review examines how the materials provided within the supplemental website can be beneficial to the students involved in the technology course, and it identifies the benefits of electronic communications used within a traditional classroom.

The call, for the author, to change the traditional face-to-face classroom environment was primarily driven by an article by Sanders and Morrison-Shetlar (2001). This article documented that including web-based elements within a traditional college biology classroom increased student learning. The concept that a supplemental website will have value in traditional classrooms is supported by Wheeler and Jarbroe (2001) who found that students with access to both traditional and online classroom elements fared better academically than students without this opportunity. Also to be considered is Sullivan, who examined the technological ability of students entering college, and concluded that "these students expect far more advanced learning experiences" (2001) The literature reviewed by the author supports the ideas of using technology as an enhancement to traditional education and as a means of communications between the participants.

The literature includes several different interpretations and demonstrations of blending online learning within the traditional face-to-face classroom in which the quality of the education did not suffer (Eberling, 2000; Grasha &Yangarber-Hicks, 2000). Kirschner, Clark, and Sweller (2006) suggest that students need to be integrated into a site slowly at first and, as they gain confidence with its use, allow continuing exploration autonomously. Once students are immersed, and become conformable in the blended environment, the literature suggests that some students will prefer the online environment because of the positive community experience (Conrad & Donaldson, 2005; Ellsworth & Ellsworth, 2003).

Another incentive for implementing a blended classroom environment is the encouragement it presents for students to be *technology-able* learners in a media-rich technological world. Scott, Chenette and Swartz (2002) concluded that by integrating liberal arts learning into a technology-centered forum, the students would be able to understand, create, and participate in the various means of digital communications. Also, as noted by Fox (2000), the college graduate of today should have such technology skills which are all but an expectation by our modern technological society.

A variety of studies measured students' perceptions of blended-learning environments. One such study was conducted at DePaul University, where freshman students were required to take a face-to-face course in Applied Psychology, but which had the addition of a supplemental website for them to access all course materials, activities, and course information. Their opinions were then solicited concerning the course's success. Students who participated were asked to answer a survey based upon their perceptions of the instruction. Using a Likert scale of one through seven, the

average student rated the helpfulness of the web-based materials in learning course material and studying for examinations at 6.58. Furthermore, when asked how well they liked having all the course materials available to them through the Internet, the average student rating was 6.74 (Beatty, Feldman, Leonard, Gerace, St. Cyr, & Lee, 2001).

Manal Aziz-El-Din El-Tigi (2000) conducted a study into students' perceptions of course websites as supplemental resources. El-Tigi surveyed 285 students, of which 142 students responded at Syracuse University, with a 40-question survey that looked specifically at how students used supplemental websites. The top three applications were: searching the Web with hyperlinks provided by the instructor to preselected resources to access reference materials and/or conduct research for the course (78%); downloading/printing information from the course Web site (72.6%); and communicating with instructors via e-mail to make a suggestion to complain or ask questions about the course (52.8%) (El-Tigi, 2000). As with the DePaul study, El-Tigi's results demonstrated that students had primarily positive experiences when exposed to a dynamic blended-learning environment.

In order for the author to gauge the success of the supplemental website, the notion of learning must be considered and observed. Driscoll (2000) referred to learning "as a persistent change in human performance or performance potential" (p. 11). Blackmore (1996) suggested that if an instructor wanted to enhance a learning environment, he/she must be conscious of the many learning styles within the student population. The blended-learning environment, just like any other environment, will have varied learning styles. Morrison, Sweeney, and Heffernan (2003) concluded that

instructors should be aware that learning styles may vary from the traditional classroom to the online environment, and design instruction accordingly to aid learning.

Using Howard Gardner's theory of Multiple Intelligences (1999), the following scenarios are suggested for supplemental websites in a blended environment. Verbal/linguistic learners will benefit from the lecture style of instructional delivery and online tools, such as downloaded prerecorded lectures in podcast form, could provide additional assistance (Frydenberg & Davi, 2006). Students who are visual/spatial learners to be further engaged by providing downloaded PowerPoint presentations of lectures which the students can follow along on their own computers (Young, 2004). Additionally, both types of learners could be encouraged to use lecture notes in an outlined form and instructors can allow these students to add additional notes to increase their understanding of the topics (Kiewra, 1985). According to Davies, Ramsay, Lindfield and Couperthwaite (2005), students who viewed streaming video or video via CD-ROM's were able to develop their observations and analytical skills, again aiding those who may be visual/spatial learners.

The population of the classroom environment of the author's blended course were adult learners. Darkenwald and Merriam (1982) defines adult education as "a process whereby persons whose major social roles are characteristic of adult status undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values or skills" (p. 9). In order to capitalize on the characteristics of the adult learner in a blended environment; Simonson, Smaldino, Albright, and Zvacek (2003) expressed that in order to establish an environment that is conducive to adult

learning it must provide a feeling of mutual respect, collaborativeness, trust, openness, and authenticity.

Assessment of the learning occurring in a blended-classroom environment must also be examined, in order to establish that the purpose of the project is being met. First to be discussed is the establishment of competencies. Defined by Jones, Voorhees, and Paulson (2002) competencies are " the combination of skills, abilities, and knowledge needed to perform a specific task" (p. 7). The competencies establish what it is the students will need to learn in order to be successful with the subject matter. These competencies should then align with blended website's materials, assignments and activities, to allow the instructor to assess whether the learning is taking place (Dunn, Morgan, O'Reilly, &Parry, 2004).

Lastly, electronic communications including email, discussion boards, and chat rooms are possible through the supplemental website and expand the boundaries of the traditional face-to-face classroom. Ellsworth and Ellsworth state, "Constructing meaning and building community works better in the web world than in any other learning situation. Communications are rich, address the subject of the course, and give a clear indication of the level of understanding" (pg. 6). Technology allows students to communicate with people all over the world to conduct research, work, and collaborate (Rice & Wilson, 1999). Kim (2000) also noted that well designed online collaboration creates positive communities, and that these communities will aid in the members meeting the goals of the participants.

Project Development

The Dick and Carey instructional design process (2009) was used in developing this project. The instructional design process is divided into the following nine steps: identify instructional goals, learner analysis, instructional analysis, performance objectives, assessment instruments, instructional strategy, instructional materials, formative evaluation and summative evaluation.

Identify Instructional Goals

The first step in developing the ISCMW was to conduct a needs assessment of the students who were involved in the author's technology courses. The needs assessment intended to define the instructional goals of the supplemental website and the materials and the steps required to achieve these goals. The author noted that upon deployment of the initial supplemental website, which only included minimal course materials, the students involved in the courses would continually ask for further course materials, such as lecture notes, the lecture PowerPoint presentations, and other various materials used in the traditional face-to-face classroom. The supplemental website needed to be improved if the website was to be truly a portal for not just classroom materials, but a place for students to further explore the topics taught in the face-to-face classroom, thus creating more of a blended environment.

The main tool used for the needs assessment was the third week of an eleven week course and end-of-term instructor/course evaluations conducted by the college where the author instructs. Both of these evaluations, which are completed by the students, provide the instructors with insight into how the students felt the courses were conducted. The author took this opportunity to ask the students to make comments on the

website as well and those comments were then used to revise the website and the materials included within it. Additionally, discussion with students indicated that the website needed improvement if it was to fill its role as an overall supplemental website. The author also spent time on the Internet, looking at many other supplemental websites, and noted that many of the sites all had elements of an effective supplemental website. The goal then became to bring these elements together and to implement the suggestions of the author's students in order to develop a comprehensively improved supplemental website for the college technology courses taught by the author.

Learner Analysis

The intended audience for the project was any student in the Information Technology program at the University where the author taught. The students who were involved in this project were what many would consider non-traditional students with an average age of 27 years old. The information technology classes were about 80% men. The typical student at the college was employed full time and married, often with children at home. Many of these students had never stepped into a college classroom before. In order for the student to be in one of the authors' technology courses, he/she must have had at least one introductory-level computer course. The course most often taken by students to fulfill this requirement was the Software Applications course, which involved the students being exposed to the basics of using a computer, the Microsoft Office Suite, email, and the Internet. This requirement ensured that students had the basic knowledge set required to be involved in the technology courses, and it also aided the author to know that the students had the required technology skills for both his technology courses and for using the supplemental website.

Instructional Analysis

In order to provide the students with basic and supplemental course materials and to aid in current course needs and additional autonomous course exploration, the ISCMW project was developed. The website provided the students involved in the author's Information Technology courses an online portal to access current course materials, additional supplemental materials, and a means to communicate with both the instructors and classmates. As the students interacted with the supplemental website, they were still involved in the traditional face-to-face college classroom environment; however, the website provided materials that could be accessed both inside and outside of the classroom. This allowed the students to access current materials at a later date to aid in the further understanding of the topics that were presented in the classroom. Students also were able to access materials, such as hyperlinks to related articles, flash player movies, and audio clips. This additional information provided a further explanation of what the student may have missed in the classroom, or could provide additional information and learning related to the topics in the classroom.

Socially, the website demonstrated value by allowing for both synchronous and asynchronous communication, which can involve both instructor to student and student to student. The communication assets of the website allowed students to communicate with the instructor or classroom peers, to ask questions or address concerns about what was being taught. Additionally, the instructor was able to use the asynchronous communication tools to generate ongoing conversations between the students, moderated by the instructor, to discuss current topics presented in the classroom. This aided in

stretching the bounds of the traditional face-to-face classroom, and allowing the instructor to check the students' comprehension and understanding.

Performance Objectives

The primary goal of the ISCMW was to improve the traditional face-to-face college technology classroom by presenting to the students a website that provided numerous course materials in a digital format. The supplemental materials also included resources for autonomous discovery and communication tools to broaden the scope of the educational experience of those technology students. Supplemental technology course websites for students provide technologies that can help students learn in ways they find most effective and broaden their repertoires for learning (Chickering & Ehrmann, 1996).

Based on the results of the needs assessment, the students and website needed to be further examined to identify the performance standards that the students would apply to the website. The performance standards to attain the goals of the ISCMW were as follows:

1. The students will access the most currently available course materials presented within the website without broken links, lack of bandwidth, or other technological issues.

2. The students will access supplemental materials presented in the website to enhance the learning experience without broken links, lack of bandwidth, or other technological issues.

3. The students will use both synchronous and asynchronous means of communications provided by the website to either communicate with the instructor or peers within the same course.

In order for the students to achieve the desired instructional goals of the supplemental website, the following procedures were identified as required steps the learner must be able to accomplish in using the website:

1. The students will access the course materials provided by the supplemental course website to further explore current course topics.

2. The students will access supplemental materials within the technology course website to further explore additional topics related to the current technology course curriculum.

3. The Supplemental Website will allow interaction for the students through navigational cues and dynamic content as the site is being used, and all materials will be easily accessible and downloadable.

4. The students will use the communication tools within the supplemental website in both a synchronous and asynchronous mode.

The goals of the ISCMW were then further examined to determine if any additional skills needed to be identified. Dick, Carey, and Carey identify these entry-level skills as both the psychomotor and cognitive domains (2009). The psychomotor skills refer to the student's ability to integrate physical and mental activity. The entry-level skills required to obtain the requirements of the first goal include:

a) The ability of the students to reasonably navigate the website.

b) The ability of the students to recognize navigational tools and download links.

c) Once the materials are downloaded, the students must know how to further access the materials using the computer.

The subordinate skills required to achieve the second goal are exactly the same as the first goal. To reiterate, the students must be able to successfully navigate the website, recognize the website cues that determine where the navigation is and where the materials are located, and then lastly, once the materials are downloaded, the students must be able to use the computer to access those particular materials. The subordinate skills related to the third goal are more relevant to the website than the students involved in the classroom experience, but the author felt it necessary to include that the website must meet certain navigational requirements as well in order to be successful and to allow the students to reach their instructional goals. These subordinate tasks to the website include that all materials are in an Internet-ready state, the design of the website is such that cues to navigation are clearly noticed by the student, and that all materials are available to the students without being cumbersome, thus presenting reasonable download times. The final goal consisted entirely of the facilitation of communication between student-to-student and students-to-instructor. The subordinate skills required within the cognitive and psychomotor domains are the ability to use email hyperlinks; the student must be able to successfully navigate and interact with both an electronic bulletin board and an electronic chat room. The subordinate goals are further identified with the instructional objectives below:

1. The students will access the course materials provided by the supplemental course website to further express current topics taught.

   a. The students will be able to access the most current course curriculum provided by the university from the supplemental website.

b. Students will be able to navigate the website using properly cued hyperlinks to web resources used on the site; the students will not experience links that are broken or materials that are outdated.

c. Students will be able to use all materials downloaded from the website using a computer and preinstalled software.

2. The students will access supplemental materials within the technology course website to further explore additional topics related to the current technology course curriculum.

a. Students will be able to access additional course materials, in a multitude of presentation types, which will supplement the course offerings and further student understanding of the topics taught in the traditional face-to-face classroom.

b. Students will be able to use all materials downloaded from the website using a computer and preinstalled software.

3. The Supplemental Website will provide feedback to the students by navigational cues and dynamic content as the site is being used, and all materials will be easily accessible and downloadable.

a. Students will be able to access resource materials, such as PowerPoint presentations or Word documents.

b. Students will recognize hyperlink cues by the use of colored hyperlinks.

c. Students will be able to access a website map, available at any point in their navigation, and each item on the map will provide further hyperlinks.

4. The students will use the communication tools within the supplemental website in both a synchronous and asynchronous mode.

    a. Students will be able to use communication tools, such as email forms, to communicate with other students and the instructor via the website.

    b. Students will be able to use the asynchronous bulletin board to communicate with other students or the instructor when required.

Assessment Instruments

The assessment of the ISCMW was critical in measuring success, and the author had three avenues through which to conduct this assessment. The first set of tools, developed by the college where the author instructs, was in the form of satisfaction-opinion surveys conducted at the beginning and end of each course. Both surveys allowed the author to poll the students in regards to desired improvements within the course, from both the onset and at the conclusion. Another tool used by the author to measure the success of the website was provided by the server on which the website is hosted. The server has several built-in software tools which look at user counts, user logged on time, errors incurred while navigating through the site, and errors to access any of the resources. Lastly the author applied informal discussions with students involved in the course, to gauge their perceptions of the site, whether the site was useable by students, and if there were technical issues with the site that students had encountered. All three means of assessing success of the website's use allowed the author to directly match the success of the website's offerings with fulfilling the objectives for the students.

Records of server use (server logs) were used to examine any particular technology issues with the website or materials. With either a change of hypertext scripting, delivery, or format, the corrections could be made by the instructor to ensure that the particular technology was available for use by students. The students were encouraged to use the technology at all times and to report to the instructor any issues that arose due to the use of the technology. Because of such *real time* reporting by the server, technology-type issues were usually resolved quickly.

At the conclusion of each session in which the website was used for a technology course, the instructor used the *End of Term* evaluations provided by the school to discover if there were items of technology, presented via the website, that were in need of change to improve the delivery for the students in the course.

Instructional Strategy

The chosen instructional strategy for the ISCMW was to provide a supplemental tool for a traditional face-to-face college Information Technology course which allows the students to access up-to-date course materials; such as syllabi, schedules, and lecture notes. Additionally, the instructional strategy permitted the students an opportunity to further explore the topics taught in the college courses by providing additional multi-media enhancements of the topics taught during the traditional classroom delivery mode. The original problem that the instructor noticed was that the time constraints of the traditional face-to-face classroom did not allow for further explorations of the course topics. Furthermore, the instructor noted that students wanted access to course materials at all times. Items such as assignment descriptions were useful to the students when working on their assignments at home without the instructor present.

The website acted as a catalyst for gathering important course information while the students were actively engaged in the Information Technology course. The website also allowed for autonomous exploration by students while not within the confines of the traditional face-to-face classroom. This is especially important because its helps keep the students engaged with the curriculum of the course without the need to actually be in the classroom and furthers their knowledge of the topics. This is in accordance with the findings of M.J. Hannafin (1992) when he stated, "Most inquisitive learners have been at least supplementing their pre-college studies, utilizing Internet communications technology" (p. 56).

Instructional Materials

The instructor had already developed the instructional materials for the ISCMW project, as he had taught the courses supported by the supplemental website several times before the inception of the project. These materials included lecture notes, a syllabus and assignment schedule in Microsoft Word format, course unit presentations in PowerPoint format, and various other demonstrative course materials in several non-web formats.

An additional consideration for required technology for instructional materials required by the students to participate in the ISCMW was a computer and access to the Internet to retrieve the online materials. The computer needed to be reasonably new, in order to take advantage of newer technology included on the supplemental website, and updated to include newer plug-ins and media players. Additional instructional materials that would be convenient for students to have in order to take full advantage of the project were a printer and possibly an iPod or MP3 player for pre-recorded lectures. For students who do not have access to a computer, the college where the author was

employed, had several computer labs for students to use to access the supplemental website; all these computers met the course requirements.

Formative Evaluation

After the initial deployment of the site, in which the students had used the website during the first week of an eleven-week course, the author assessed the impact of the website on the students and how they felt about the helpfulness of the website. This formative assessment allowed the instructor to make corrections to the website as needed, especially for errors that can quickly be amended, such as a broken hyperlink or missing materials. This also allowed the author to upgrade the website, (e.g., updating download instructions for materials) to make the website more useful to the students.

Summative Evaluation

Toward the end of each eleven-week course session, the instructor conducted a summative evaluation of the students, concerning the use of the supplemental website. This evaluation allowed the author to make larger overall changes to the website, such as material reformatting, accessibility restructuring, or automating scripting, in order to better address the areas where students felt there were shortcomings. This summative evaluation can also occur after longer periods of time, after several courses have been taught, to aggregate the results. This may allow for better understanding of the effectiveness, since each class group can be different from one another.

The Project

The focus of the ISCMW project was to introduce college-level Information Technology students to a supplemental website. The project began when the author created a website aimed at providing students with supplemental course materials and electronic communications.

The materials of the website included electronic course materials; such as syllabi, lecture notes, demonstration PowerPoint and Flash movies, hyperlinks to additional online materials, and several modes of electronic communication. The ISCMW allowed the learners in the technology courses to access additional course materials and extended communications and to experience what became a blended-classroom environment. This project consisted of developing a supplemental website and then converting course materials into a web-based format that could be accessed by students from a computer with an Internet connection.

The project occurred in four phases. Phase one prepared the students to participate in a blended-classroom environment by providing them the required skills. Phase two introduced the website and a student skills survey. Phase three was the actual use of the website both in and out of the traditional face-to-face classroom which created a blended environment. Phase four evaluated the success of the website.

Preparation Phase

This phase of the project ensured students had the required skills to use the ISCMW effectively. It consisted of the learners completing a prerequisite course called Software Applications, which is required of all students who enter the Information Technology program. The course prepared the students to work with computers in or out

of college-level computer courses. Topics included in this course were the Microsoft Office Suite (specifically Word, Excel, Access, and PowerPoint) and basic Internet usage and web-based email. The instruction the students received in this course not only prepared the students for progressing within the Information Technology program, but it also ensured that the students possessed the necessary skills required to use the supplemental website.

Introduction Phase

Phase two began with the implementation of the supplemental website, which started the first day of the Information Technology course. The students were introduced to the course, not with the traditional paper syllabus, but by logging onto the website. The process had two purposes: a) it demonstrated to the instructor that the student possessed the required skills to use a computer with Internet access, and b) it demonstrated to the instructor that the students were able to specifically navigate the supplemental website to find needed materials, communication tools and assignments.

Before the instructor discussed the syllabus with the students, the students downloaded the PDF version of the syllabus and printed out a copy for their records. At this point, the instructor then went through the particulars with the students. This portion of the introduction established that the students had the needed skills to download required materials. If a student struggled with this exercise, the instructor scheduled time with that person to remediate what should have been learned in the Software Applications course. Although a rare event, on occasion, this was required of the instructor.

During a discussion of the assignments required of the students, the instructor presented where on the website the student would find the materials related to the

particular assignments. The materials included items such as in-depth assignment explanations, assignment grading scales and rubrics, and hyperlinks to additional online materials from other Internet sources to aid in the completion of particular assignments. These documents were in either Microsoft Word or PDF format for downloading. This concluded the first phase of the project, the introduction and skills check of the website.

Once students had copies of the syllabus and the assignments had been discussed, the instructor presented the rest of the website to the students. This included a tour of where the further supplementary materials resided, what type of formats were included for the materials, and suggestions as to how students may want to use the materials. This concluded the second phase of the project.

Implementation Phase

During this phase of the project the students used the supplemental website in a blended-classroom environment. They accessed the website both in and out of the traditional face-to-face classroom for the duration of the technology course. It is important to point out that the website serviced more than one course, and each course took a different path in using the website to create the blended environment. Below is a summary of how the instructor generally used each of the elements within the supplemental website and, other than the first paragraph, they are in no particular order.

One of the first assignments the students would engage in was an introduction of themselves and what they hoped to learn from the technology course. This assignment was completed through the website's electronic bulletin board. The students were required to sign up for an account and respond to the question posed earlier. From this point, in regards to the bulletin board, additional questions would be posted that the

students would be required to answer. A number of responses from student-to-student were also required by the instructor, in order to create a dialogue based on a certain topics. The instructor acted as moderator to all postings and ensured that conversations stayed on topic and were of a professional nature. Students were given participation points for their postings.

In regards to communications via the supplemental website, the students had access to the instructor not only through the bulletin board, but also through a live chat room. The instructor scheduled chat sessions at designated times, usually after a television show the instructor required the students to watch in lieu of classroom time. He then facilitated a conversation based on what the students had just watched. This was very beneficial because the show watched was fresh in the students' minds, and therefore the conversations were more effective versus waiting until the next scheduled classroom instructional period to make the connections. This was also effective for other activities required outside regularly scheduled classroom time that required an immediate response from the instructor in order to capture the immediate thoughts of the students.

During traditional lecture periods of the course, the students were encouraged to download the Microsoft Word, PDF, or PowerPoint version of the lecture notes. This allowed the students to follow along with the lecture; the instructor also encouraged the students to take notes directly on their printed materials to be referenced at a later time.

For assignments that required research, the instructor provided all necessary materials within the website. This included items such as assignment descriptions and requirements, assignment rubrics, and hyperlinks to assignment resources outside the supplemental website. Having such materials available meant that students could access

these at anytime. This also avoided the need for paper copies of the various materials in a handout format. The hyperlinks provided students with access to online journal databases, libraries, and current technology websites that aided them during topic exploration and in preparation to complete assignments. The hyperlinks guided the students, during their research periods, to materials that were more academic in nature which increased the quality of the research.

If a concept presented in the classroom required further demonstration, such as the installation of a network card, the students were able to go to the website at a later time, and watch the Flash movie of this demonstration. Students were also assigned to watch presentations, in the form of Flash movies, from experts in the field of technology on topics pertaining to class, to generate discussions. Flash movies were also valuable when dealing with the PowerPoint presentations. During further development of the site, the instructor discovered that PowerPoint presentations could be converted to Flash movies. The HTML versions of PowerPoint were very large files; they required significant bandwidth to view which made this method cumbersome for students who did not have broadband. This was not the case for PowerPoint converted to Flash movies; in fact the instructor discovered that the opposite occurred for all the band-width problems previously discussed.

The instructor provided numerous opportunities for students to autonomously explore technology topics using the supplemental website by strategically providing hyperlinks to current event sites and articles. On occasion, engaged discussions were sparked based on articles found by the students. Topics ranged from current technologies to security issues in regards to the new technologies, to the ethics of new technology

implementation. These discussions further engaged them into their chosen field as technologists and helped make them more aware of the impact of new technologies.

Many of the software titles used in the instructor's technology courses were quite expensive, making them out of financial reach for students. With the large amount of space available on the server, the instructor provided such software in the form of shareware, free trials, and open source alternatives to the students. The software, such as an IP calculators or PhotoShop alternatives, were free items the students downloaded. This enabled them to further explore and practice the functionality of software they may use in the field. Having the alternative software on the website saved the students from having to search the web themselves, and the instructor was able to make sure that the titles were functional, close to what was used in class, and virus free.

One additional item to note about having the web server host the supplemental website was the ability to allow the students to interact with a server. In many technology courses the students complete their work using virtual emulation tools to demonstrate concepts or complete homework. The emulation tools are acceptable alternatives, but do not truly mirror how real servers react as students work through assignments. The instructor provided students access to the web server for various web programming, server administration, or networking assignments. The ability to work with a live server provided students with real experiences rather than the emulated alternative.

Evaluation Phase

Evaluation of the supplemental website was a continual process and included both formal and informal components. There were, primarily, three ways in which the

instructor was able to evaluate the effectiveness of the website. The three means of evaluation included the informal process, the formal survey process, and the server logs.

The first method of evaluation, informal conversations with students, was the most frequent of the evaluations to occur in regards to the supplemental website. The conversations with students occurred at any time, whether discussing the website or not; students were always good resources about how to improve usability. They would ask for changes to the supplemental website whenever they had requests for additional materials to be posted, corrections for non-working elements, or suggestions for alternative methods to present materials.

The instructor always heeded the suggestions of students, as they were the direct users. If the revisions were possible and feasible, the instructor made the changes to the supplemental website. If a suggestion was not possible, the instructor would discuss with the student why changes were not made, and then work with the student to ensure the current method was understood and accessible. Corrections to functionality, especially non-working elements of the supplemental website, were attended to immediately. This aided in students not losing interest in the supplemental website because elements of the site did not work.

The formal assessment of the supplemental website occurred twice during the technology course. The first assessment was an instructor and course materials survey the college administration required all instructors to conduct. The administration approved including the supplemental website as part of the survey and the instructor instructed the students to consider the supplemental website when answering questions about classroom materials.

The second formal assessment of the supplemental website occurred at the conclusion of each technology course. This End-of-Term Survey was another formal evaluation the students participated in, and was also conducted by the college administration. Within this survey, there are many questions specifically geared towards the support methods and additional classroom materials available to the students during their course. The instructor again reminded the students to include their thoughts about the supplemental website, expressing that the students' thoughts would help guide the design and inclusion of available materials.

The instructor aggregated and analyzed the results from both surveys immediately after they were conducted, focusing on anything that required the instructor's immediate attention. Based on the analysis, the instructor updated any coding or syntax errors within the supplemental website. In response to suggestions on improvement of the supplemental website, the instructor researched the suggestions and determined whether such changes were possible, beneficial, and /or feasible. From this analysis, the changes may or may not have been made but all changes to the supplemental website were always carefully considered before they were implemented.

The last method used for analysis of the supplemental website was the website server logs. The server logs contained numerous reports that were of technical benefit to the instructor, such as page/resources not found (404 errors), hyperlink errors, and other technical issues that may have been occurring within the web server. Many of these reports alerted the instructor to the technical issues the students may have been experiencing and it also provided the instructor with reasons why the errors occurred.

Based on the server logs analysis, the instructor fixed any technical problems the server may have been having and then ensured the difficulty had been resolved.

This completes the four phases of the supplemental websites implementation, but the four-phase approach continues as the supplemental website continues to be used. These phases were especially observed when a new element or material was added to the website.

CONCLUSIONS AND RECOMMENDATIONS

Insights Gained from Project Development

The ISCMW project has been an ongoing project since 2001. The website and the materials included have had many major changes over that time span. The original website was simply a tool the author used to offer hypertext documents to help students get basic course information. As the website's use and importance increased, the website became an official project. It was at this point that the author began to use more formally developed tools to assess the student's needs and this provided direction for defining the project's instructional goals.

It was beneficial for the students to have a classroom website which supplemented the instruction and could be reached outside of the traditional classroom environment. It helped them stay in touch with their work and seemed to help the students learn more deeply, even when they were at home or wherever they had access to the Internet. Based on the formative assessments made by the author, the supplementary website clarified doubts on assignments and reduced time spent over lost assignment sheets or reading lists.

Another benefit was that the author found that the website helped introduce and discuss concepts beforehand. Concepts that needed thorough understanding before a subject could be taught were placed on the site and posted for discussion, so that the students could be prepared for subject material when it was addressed in class. Students also found it useful when they could have homework discussions and group meetings over the website, thus effectively managing their time and completing the work well within their deadlines.

Future Projects/Research

Other members of the faculty, with the help of the author, are currently

duplicating this project. It is the author's hope that the results will be similar and that

more students can be affected by supplemental websites. The author would like to further

develop the supplemental website, with the expectation to continually provide more

course materials, in several different formats and up-to-date multi-media to enhance its

usefulness. The author would like to explore, as bandwidth availability and speeds

increase, collaborative work with other instructors via teleconferencing.

Recommendations

The assessment of the students' needs have to be considered regularly and if there

are learners who need technological training, this can be addressed either physically in

the classroom or virtually, through the website. Actually, all the necessary material for

basic Internet and computer training can be posted on the website itself, in a user-friendly

manner, so that any student comfortable with holding a mouse can learn on his/her own.

For example, if the class is an introduction course for freshmen-level students,

then it is in the best interest of the instructor to make the website basic in its presentation

to ensure that all the students will be able to navigate the site. Further, if the site is for an

advanced Web Design course, the instructor may want to include various media

inclusions within the website to engage the students with what is possible with the

Internet.

The author has used design templates that are easily navigable, with clear links to

the rest of the website wherever necessary. This has avoided any confusion students or

parents might have about browsing the site. However, first-time visitors are encouraged

to read the author's professional page, teaching philosophy page and syllabus page to have an overall idea of what is expected of the students and how their performance will be observed and graded during the course.

Continuous classroom assessments have to be a feature of the website. Certain common features for such assessments can include course goals, direction for navigating the site, focus questions on strategy, and the indications for proper use. Tools such as concept tests, attitude surveys, and student assessment on learning gains can be applied to gauge the effectiveness of a supplementary website in a traditional classroom.

If the site is to enhance the student experience, what is posted should support the course curriculum; furthermore, anything to be included should be updated regularly to ensure that the site's information is current. It is also important that anything posted should be centered in direct support of the outcomes of the specific course. If the included information does not support the course outcomes, there is a chance that the students will become disenfranchised from the course and may not meet the course outcomes.

Other information that can be provided on supplemental websites includes hyperlinks to other websites that supply enhancement materials, such course textbook sites or similar professional websites. Explanatory graphic images, animated flash movies, and expressive audio are all engaging examples of media that could also be included within the site. An excellent source of such additional materials to be included in the ISCMW can be solicited from student recommendations. With these recommendations included, the instructor must ensure that the provided materials, hyperlinks and multi-media is applicable and recent information in support of course

outcomes. The layout of the site should be logically arranged with descriptive hyperlinks, visually appealing, and easy to navigate.

The use of media is needs to support attaining course outcomes and is not cumbersome to implement or view online. Providing a means of communication for both students-to-instructor and student-to-student encourages further student learning. Observation of the discussed practices while planning and constructing a supplemental classroom website should aide the instructor in producing a successful website for students.

It is up to the instructor to provide sufficient training for the students on how to use the website and what resources are available on the site. This type of instruction would begin the first day of the course. It is an excellent time to evaluate if the students have the required skills necessary to navigate the site by simply having them go to the site to retrieve the syllabus. The instructor can also assess some prior computer knowledge by having the students print out a copy of the syllabus for their records. This allows the instructor to see if the students possess the necessary skills to navigate the websites basics and, if they do not have such skills, it would be an appropriate time to strengthen those skills. At this time the instructor may also find that there are other individual student restrictions to using the website such as visual challenges and accommodations can be implemented to amend these types of issues.

Outside of the classroom, the instructor may provide assignments that refer the students to the website for readings, tutorials, and assignments. Having the students read online chapter summaries and then posting a review of the literature on the bulletin board is an effective means of engaging the student to use the website. To further the

experience, the students could then post a response to one of their classmates' summaries. This encourages the students to connect with each other and create that dialogue. This type of *conversation* could also be recreated with email if a bulletin board is not a resource the instructor is ready to implement.

An instructor must constantly assess the students in the classroom to ensure that the website is being used to successfully support the students' needs. The assessment will certainly provide the instructor with information as to whether the websites' content and presentation is successful in accommodating learning styles and enriching the curriculum. Changes to the site can then be based on this assessment to improve the quality and delivery methods of the website until the appropriate configuration is established.

The results of this project indicate that students can develop a better understanding of the course materials as well as a good relationship with the instructor with the enhanced communications provided by the supplemental website. The instructor can also take the role of a mentor, guiding students through their various activities outside the classroom, but related to the subject and the course. A supplemental website can definitely make an impact to advance the traditional education that students have historically experienced. Imagine a world where every classroom has a supplemental website, it would be remarkable, and possibly change the face of traditional education.

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Appendix A

An Additional Resource for Instructors:

Creating a Supplemental Website - A Quick How-to Manual

The first step is to examine the websites' proposed design and organization. The design and organization should make the website pleasing to look at, easy to read and allow for easy navigation by the users. Figure 1 is a screenshot of what the user saw when the URL was typed into the browser. The second image, Figure 2, is a diagram of how the website was laid out organizationally to demonstrate for the reader what the process would look like. Both of these steps are useful to aid in the production process to provide a "road map" to aid in the design of the supplemental website.
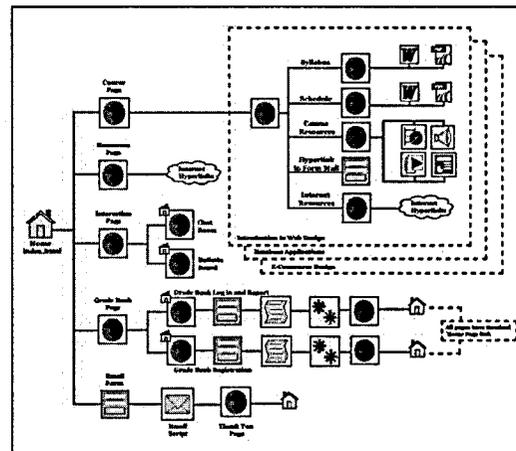

Figure 1.

Figure 2.

The following materials were provided on the author's supplemental website:

- Microsoft Word Documents: Documents such as the syllabus, course schedule, lecture notes, and other supplemental documents were offered in this format. The document format was selected because of its portability, accessibility, and the ability to hyperlink right from the Microsoft Word document, even after it has been converted to a HTML web document (Watson & Wong, 2002). As mentioned previously, Microsoft Word documents are easily converted into HTML, or web-ready, documents.

- Microsoft PowerPoint Documents: Many instructors use PowerPoint in their traditional face-to-face classrooms because of the advantages that the PowerPoint provides in regard

to the delivery of information to students (Welcome to the World, 2008). PowerPoint can easily be converted for use on the Internet in both hyper-documents, or as flash movies. PowerPoint documents can also be converted into the Adobe PDF document type, either in a slide by slide or every slide in a single page format. The author discovered that these have smaller file sizes, which may be advantageous if file size is limited or bandwidth is not broadband.

- PDF Documents: PDF, or Portable Document Format, is a product of the Adobe Software Corporation. This file format works with a number of document types, including Microsoft Word and PowerPoint. Students can easily view PDF documents from the *Supplemental Website* because most computers already have the Adobe Acrobat software required to read the files. The conversion of documents to the PDF was more difficult, as the software to convert a document to PDF can be expensive. Several online alternatives, however, are available (See Appendix B). The particular challenges in using PDF converters are discussed in the needs assessment section of this document.

The next portion of this guide deals with the actual building of the website, and is provided as a guide for readers who would like to do the same for their courses. As the process was described for the needs assessment in the project section of this document, the author also included explanations on the various requirements, and possible solutions for those who may not have the same resources. These tools include an HTML editor, a web server, conversion software, and website add-ons.

Creating the Website

The first step was to find an HTML editor, preferably one that used a "What You See Is What You Get" (WYSIWYG) interface. This is a web editor program that allows

the creator to use a drag and drop environment to create the website. As the user creates

the website, the software writes the HTML code in the background. This makes this type

of software quite valuable because the creator doesn't have to be a master at HTML to

create the website, and these types of software can also provide uploading of the website

to the web server capabilities. Adobe Dreamweaver MX was selected to build the

supplemental site as this software was provided by the author's college. If this software is

something that a particular institution does not have available, there are many free

alternatives available on the Internet for download. Some of the author's favorites are

listed in Appendix B. Although there are other alternatives, such as Microsoft Word or

Front Page, these are far harder to learn and overcomplicate the HTML code. The author

has used many versions of web authoring software and strongly suggests sticking to

WYSIWYG editors.

The next step is to determine where to host the website. Most educational

institutions allow instructors to have space on organic web servers within the school. If

this option is available, then simply stop by your school's Information Technology

Services (ITS) office to learn how to gain access. If your institution is like most, the

Information Technology Services office has instructions on how to access, upload, and

manage the space available to you. Also, the student access from such web servers

usually has easy-to-use URLs such as http://www.youruniversity.edu/drsmith, which will

help the students easily find the web server. The author's experience was a bit different

as his particular institution didn't have web server space for instructors and so he had to

find an alternative. The author conducted an Internet search of the web to find a hosting

company, and discovered that there are a lot of them out there. However, with so many

choices, the world of web hosting can quickly become confusing. Christopher Heng (2009) offers some criteria to consider when choosing a hosting company:

- Determine there is ample space for the items you would like to upload; most standard web hosting packages provide more than ample space for a supplemental website.

- Determine that the website provides FTP support; this is to accommodate the WYSIWYG web editor's FTP function.

- Make sure the host doesn't limit file sizes for both upload and download; this could hinder the inclusion of files such as videos or Podcasts.

- Conclude that the hosting company will provide language and database support, such as PHP and MYSQL, if items such a message board, a blog, or an online grade book will be included.

- Assess if the website offers email accounts, a web based form builder to allow for mailing from the website, and a web-based interface for retrieving that email.

- Find an Administrative Interface that is easy to understand and use. An example of the most common one, CPanel, is pictured below (figure 3).

- Ensure that the hosting company has a customer support system that can respond appropriately to any needs.

- Ensure that the hosting company is reliable in both access and uptime.

Figure 3

After some looking around on the Internet, and using the above criteria, the author was ready to choose a web hosting service. Most of the web hosting services offers a free web-hosting package as well; however, the vast majority of free sites are obligated to have advertising sections provided by the host. If this advertising is not desirable, hosting packages may be purchased. The author did not want advertising and paid about 70 dollars a year for a hosting package without advertising; this price was about average for all the hosting companies. Another benefit to using a hosting company was the ability to create a personal URL. Most hosting companies provide the registration service as part of the package. The author decided to simply go with his first and last name together as one, so the website URL became http://www.markbromwich.com. This choice was easy for the students to remember and it is important to keep the URL name simple. Appendix B lists the URLs to some web hosting companies.

Following the search of web authoring software and a web hosting solution, the next step was to determine whether the author had the ability to do some file conversions. Most of the course documents were in the Microsoft Office format, whether they were Word or PowerPoint documents. These were fine for use on the local computer and in the

classroom, but when converted the in Microsoft Office using the "save for web" function, the files were quite large and too cumbersome to move to the web server. The solution to this problem was fairly easy Using Adobe Acrobat, which the school provided, the Microsoft Word and PowerPoint documents could be converted to Portable Document files (PDF), which are much smaller and self contained and so easier to publish to the web server. An unexpected bonus was that the security settings on the documents could be changed so that the documents could not be altered. If the Adobe Acrobat is unavailable, there are several free alternatives available on the Internet. These are listed in Appendix B, under PDF converters.

Conversion software was also required to create Podcasts, which would allow for the uploading and downloading of audio and video productions from the website. Of all the software investigated, this was probably the simplest search; iTunes from the Apple website is the perfect software to make Podcasts with. A digital voice recorder was also necessary in order to record the Podcasts. The author purchased an add-on from the local electronics shops for his iPod that made it a voice recorder. If this were not an option, an inexpensive voice recorder would also work.

Lastly, the website needed communication tools, such as email, a bulletin board, and a chat room and these were available from the web hosting service. These features are important to have so and were part of the criteria used when selecting the web hosting service. The tools also needed to be simple to install and use. These features are generally not available when using a free web service. However, in this case, these types of tools are readily available for download and installation. Email was readily available from a number of providers for free, such as Google Mail, Hotmail, and Yahoo mail, so

this did not present a challenge at all. Bulletin boards and chat rooms were also quite available on the Internet and the sites that provide these services all had easy-to-read installation procedures for their particular software. Links to some of the most popular and easy-to-use bulletin board and chat rooms programs are included in Appendix B.

The author used this phase in the supplemental website development process to assess whether the constructed website was technically proficient. Specifically, the author wanted to ensure that the site is accessible on multiple platforms, that the hyperlinks are functioning properly, and that all media types uploaded to the web server are able to be downloaded and used by the students involved. The web server the author used possessed an administrative control panel, or Cpanel, that continually captured data about the service of the domain name hosted. To see a list of web statistics kept by the author's web server, and a brief explanation each, refer to Figure 4 below.
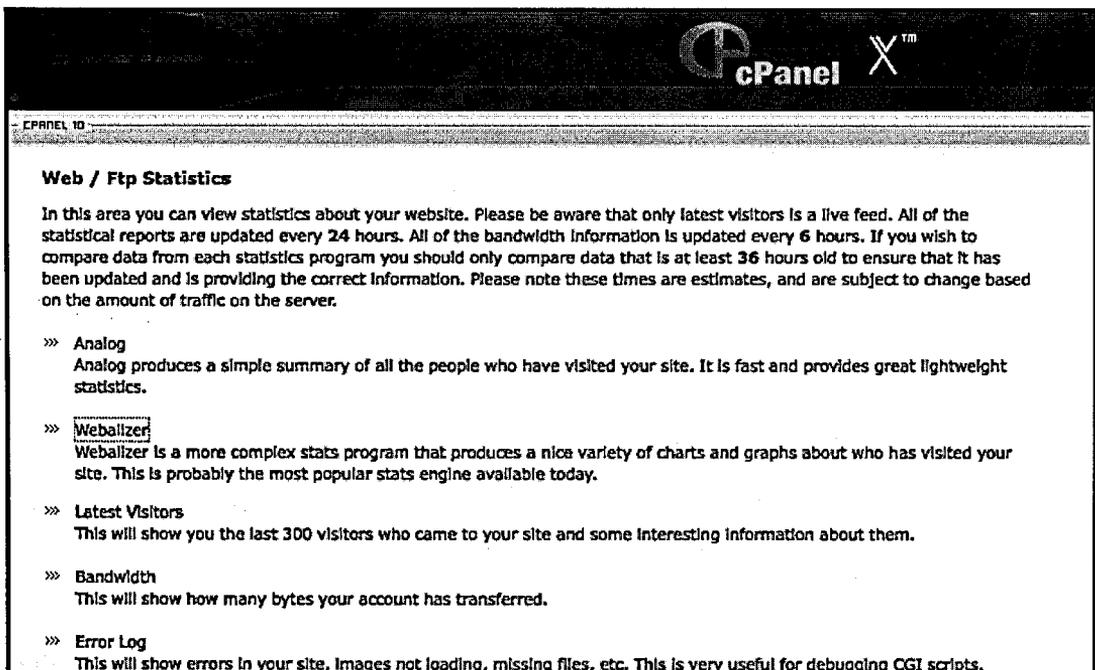
Web / Ftp Statistics

In this area you can view statistics about your website. Please be aware that only latest visitors is a live feed. All of the statistical reports are updated every 24 hours. All of the bandwidth information is updated every 6 hours. If you wish to compare data from each statistics program you should only compare data that is at least 36 hours old to ensure that it has been updated and is providing the correct information. Please note these times are estimates, and are subject to change based on the amount of traffic on the server.

>>> Analog
  Analog produces a simple summary of all the people who have visited your site. It is fast and provides great lightweight statistics.

>>> Webalizer
  Webalizer is a more complex stats program that produces a nice variety of charts and graphs about who has visited your site. This is probably the most popular stats engine available today.

>>> Latest Visitors
  This will show you the last 300 visitors who came to your site and some interesting information about them.

>>> Bandwidth
  This will show how many bytes your account has transferred.

>>> Error Log
  This will show errors in your site, images not loading, missing files, etc. This is very useful for debugging CGI scripts.

Figure 4

To assess whether the supplemental website was available for multiple operating systems and multiple browser types, the author had to use the administrative panel (Cpanel) of the web server to ascertain this information. The author first viewed the "Latest Visitors" option of the Web Stats section of the Cpanel. From here the author was able to ascertain that the web server had serviced both PC and Apple Computers. The author was also able to ascertain that from the two major operating system types, that there were four major browser types that had viewed the supplemental website. The four browser types are listed by the most used to least used to visit the site, and are listed in that order respectively: Internet Explorer, Mozilla Firefox, Apple Safari, and Opera. An example of the operating system and browser listing can be seen below in Figure 5, so that the reader may obtain an idea of the level of detail that is available in order to assess information about the users.

```
┌─Host: 24.149.28.227──────────────────────────────────────────────────────────────────┐
│        /style.css                                                                      │
│    ●   Http Code: 200      Date: Nov 02 16:03:50      Http Version: HTTP/1.1      Size in Bytes: 1670  │
│        Referer: http://www.markbromwich.com/                                           │
│        Agent: Mozilla/5.0 (Macintosh; U; Intel Mac OS X 10.5; en-US; rv:1.9.0.3) Gecko/2008092414 Firefox/3.0.3  │
└────────────────────────────────────────────────────────────────────────────────────┘
```

Figure 5

Once the author gathered information about the specifics of the operating systems and browsers of the particular visitors to the supplemental website, the next step was to determine whether there are specific problems with either of the variables in regard to access to the website. The author used the server error logs for this. This particular web server, as with most, keeps very detailed records of what types of errors the web server encounters with any of the functions that it performs. This information was particularly important to the author because it

demonstrated if there are errors with hyperlinks. This is known by the "404 file

not found" error the server would record every time there was a request for

service and the server could not fill the request. It is the author's experience that

the majority of the 404 error codes recorded by this particular web server was

because the author incorrectly placed a link to a file or did not have the resource

in the proper place. Figure 6 lists the errors recorded by the server with the file

error html removed on purpose, to demonstrate for the reader what would have

been seen in the event of a broken hyperlink or a missing file.
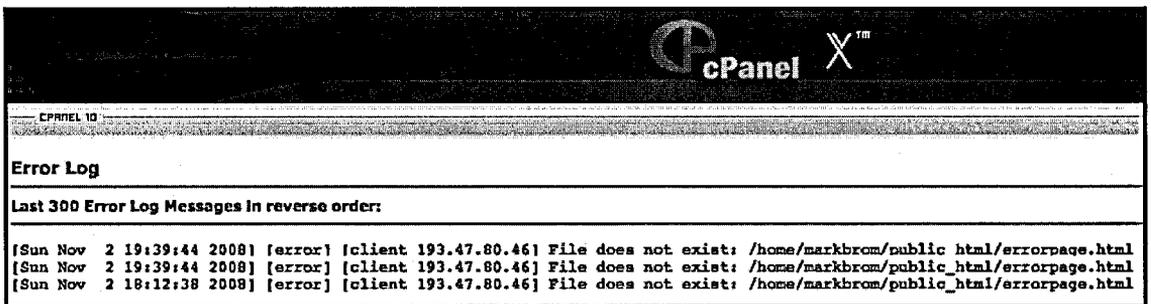
cPanel X™

CPANEL 10

Error Log

Last 300 Error Log Messages In reverse order:

[Sun Nov 2 19:39:44 2008] [error] [client 193.47.80.46] File does not exist: /home/markbrom/public_html/errorpage.html
[Sun Nov 2 19:39:44 2008] [error] [client 193.47.80.46] File does not exist: /home/markbrom/public_html/errorpage.html
[Sun Nov 2 18:12:38 2008] [error] [client 193.47.80.46] File does not exist: /home/markbrom/public_html/errorpage.html

Figure 6

After the web server was assessed for any errors, the author then ran

several tests of the media uploaded to the server to ensure that the media could be

downloaded in a proper and timely manner. The first test the author ran was a

look at the FTP logs, or File Transfer Protocol, to ensure that none of the files

requested had timed out. A file could time out if it was too big to download in a

timely matter; in this case, the server would eventually give up on the transfer.

Another way the author ensured that file transfers could take place when required

was for the author to simply log into the site from different Internet speeds and

simply try downloading the files.

Based on the assessment of the technical aspects of the supplemental web server, the author was able to determine that there were several areas where errors occurred. Below were the particular errors found, and what remedies were put into to place to ensure that these errors did not remain chronic.

The first assessment focused on whether the web server was able to fill requests by multiple operating systems and browsers. Due to the particular set-up of the server, no errors of this type were detected by the author. This is due largely to the web server running SUSE Linux and Apache, which are well suited to cross platform situations.

The next item that was assessed was the supplemental websites' hyperlinks. After the author gathered the web server error logs, it was noticed that there were several "404 file not found" errors recorded. The author then went through each of the particular errors provided by the log and fixed them. Most of the errors recorded were problems within the HTML code dealing with hyperlink syntax, where the author simply lacked the correct code. On a couple of occasions, the files requested did not exist at all, and the author was able to remedy this by simply uploading the required file to satisfy the hyperlink.

Lastly, the author looked through the server file logs to determine if there were any server timeouts due to file size being too large for FTP over a slower connection. The author was able to determine that the web server lacked any records of file timeouts; this was largely due to the file types presented on the supplemental website, and the author did not find any particular files that were unavailable for download.

Overall, the web server hosting the supplemental website functioned well, and it was noted by the author this is only on the technical side of this project. The success of

the website, in regard to student use, is recorded in the overall analysis of the

supplemental website project.

Appendix B

Creating a Supplemental Website:

Online Resources for Web Development

(WYSIWYG) Web Authoring Software Links:

Kompozer
http://www.kompozer.net/

Aptana Web Studio
http://www.aptana.com/studio/download

SeaMonkey Studio (Mozilla)
http://www.seamonkey-project.org/releases/

Hosting Services (both free and for profit)

Free Web Hosting
http://www.free-webhosts.com/

Free HelioHost
http://www.heliohost.org/

Free and Pay Geocities (Yahoo)
http://geocities.yahoo.com/

Free and Pay Anglefire (Lycos)
http://www.angelfire.lycos.com/

Pay iPower
www.ipower.com

Pay Go Daddy
www.godaddy.com

PDF Converting Software

PrimoPDF
http://www.primopdf.com/

DP doPDF
http://www.dopdf.com/

Bulletin Board Sites

phpBB
http://www.phpbb.com/

ProBoards
http://www.proboards.com/

Chat Room Software

EWC EveryWhereChat
http://www.everywherechat.com/

Bravenet Chat Rooms
http://www.bravenet.com/webtools/chat/